

ZIMMERMANN, G. et al.
Serial No. 10/674,791

Atty Dkt: 4114-8
Art Unit: 2681

AMENDMENTS TO THE SPECIFICATION:

Please amend the caption on page 1, line 17, as follows:

~~Discussion of the Prior Art~~ Related Art and Other Considerations

Please amend the caption on page 3, line 19, as follows:

~~BRIEF DESCRIPTION OF THE INVENTION~~ SUMMARY

Please amend the paragraph beginning on page 6, line 1, and continuing to page 6, line 13, as follows:

~~According to the invention, t~~The frequencies are selected in dependence on the allocated quality parameters. The selected frequencies may then be subjected to further monitoring. Generally, the further monitoring may relate to at least one of radar-like interference signals and other interference signals. If such interference signals are detected, an additional continuous or quasi-continuous monitoring can be initiated in order to again assess one or more frequencies with respect to the radar-like interference signals and to subsequently allocate corresponding quality parameters to the assessed frequencies. During regular operation at least one of receive and transmit pauses may be artificially created.

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ZIMMERMANN, G. et al.
Serial No. 10/674,791

Atty Dkt: 4114-8
Art Unit: 2681

Please amend the paragraph beginning on page 7, line 27, and continuing to page 8, line 2, as follows:

~~According to a further embodiment of the invention, the~~
~~inventive method~~ is applied each time the wireless communication system intends to change from a first transmission frequency to a second transmission frequency. Prior to switching to the second transmission frequency, the second transmission frequency is subjected to the continuous or quasi-continuous monitoring and assessing. Then, a quality parameter is allocated to the assessed second frequency. The second frequency is selected as transmission frequency in dependence on the allocated quality parameter. Subsequently, the second transmission frequency may be subjected to further monitoring with respect to radar-like or other interference signals.

BEST AVAILABLE COPY

ZIMMERMANN, G. et al.
Serial No. 10/674,791

Atty Dkt: 4114-8
Art Unit: 2681

Please amend the paragraphs beginning on page 9, line 1, and continuing to page 9, line 19, as follows:

- Fig. 2 shows a monitoring strategy of a H/2 system ~~in accordance with the present invention;~~
- Fig. 3 shows a possible implementation of radar detection and dynamic frequency selection in a H/2 system ~~according to the present invention;~~
- Fig. 4 shows a first embodiment of a H/2 system ~~according to the present invention;~~
- Fig. 5 shows a second embodiment of a H/2 system ~~according to the present invention;~~
- Fig. 6 shows a third embodiment of a H/2 system ~~according to the present invention; and~~
- Fig. 7 shows a fourth embodiment of a H/2 system ~~according to the present invention;~~
- Fig. 8 shows a flowchart including steps according to an example method of controlling frequency selection in response to radar-like interference signals.

Please amend the paragraph beginning on page 9, line 28, and continuing to page 10, line 8, as follows:

In the lower half of Fig. 2 a continuous monitoring strategy for radar detection (RD) ~~according to the invention in~~ a H/2 or IEEE 802.11a/h system is illustrated. As can be seen,

ZIMMERMANN, G. et al.
Serial No. 10/674,791

Atty Dkt: 4114-8
Art Unit: 2681

the continuous monitoring consists of a single measurement having an interval length W_{tot} which is large compared to interval lengths of the DFS measurements. W_{tot} is chosen such that it is ensured that at least one periodical radar pulse is received. Typical radar periods are 10 seconds. Thus, W_{tot} should have an extension in the time direction of at least 10 seconds. In order to identify a detected interference signal as periodic interference signal it is advantageous to choose W_{tot} such that at least two and preferably three or more radar pulses can be received. This would enable the H/2 or IEEE 802.11a/h system to make a more reliable distinction between periodic radar-like interference signals and other, non-periodic radar-like interference signals like e.g. interference signals from a tracking radar which will usually be non-periodic.

Please amend the paragraph beginning on page 11, line 13, and continuing to page 11, line 24, as follows:

As an example, P_0 may be chosen to equal 0 (no radar-like signal has been detected) and the value of P_1 may be chosen to equal 1 (one or more radar-like signals have been detected). A threshold value may be defined to equal $\theta, \pm 0.1$. For each frequency f_i to be assessed, a corresponding quality parameter $P(f_i)$ is generated and allocated to the frequency f_i . If the quality parameter $P(f_i)$ of the frequency f_i lies below the threshold value of $\theta, \pm 0.1$, the frequency f_i may subsequently be selected for further monitoring and/or transmission purposes. If, on the other hand, the quality parameter $P(f_i)$ for a specific frequency f_i lies above this threshold value, the frequency f_i is not selected.

ZIMMERMANN, G. et al.
Serial No. 10/674,791

Atty Dkt: 4114-8
Art Unit: 2681

Please amend the paragraph beginning on page 11, line 26, and continuing to page 11, line 33, as follows:

Once a quality parameter $P(f_i)$ has been allocated to a frequency f_i , the frequency f_i may subsequently be subjected to additional periodic measurements. Preferably, the periodicity of the additional measurements is chosen in dependence on the reliability of the quality parameter $P(f)$. This means that many measurements are performed if $P(f)$ has a value of approximately 0.50.5 and few measurements are performed if $P(f)$ lies in the vicinity of 0 or 1.

Please amend the paragraph beginning on page 12, line 29, and continuing to page 13, line 2, as follows:

In Fig. 3 a possible implementation ~~of the invention~~ within a H/2 or IEEE 802.11a/h system comprising a radar detection unit RD and a dynamic frequency selection unit DFS is illustrated. The radar detection unit RD performs a continuous or quasi-continuous monitoring with respect to radar-like signals and the dynamic frequency selection unit DFS performs a short-term monitoring with respect to other interference signals resulting from e.g. neighboring systems. Possible measurement strategies for radar detection and dynamic frequency selection are exemplarily illustrated in Fig. 2.

BEST AVAILABLE COPY

ZIMMERMANN, G. et al.
Serial No. 10/674,791

Atty Dkt: 4114-8
Art Unit: 2681

Please amend the paragraphs beginning on page 14, line 1, and continuing to page 16, line 18, as follows:

Step S-1 of the start-up mode (see Fig. 8) is automatically initiated when an AP (H/2, IEEE 802.11a/h) or a CC (IEEE 802.11a/h) is switched on. During step S-1 no transmission takes place and all frequencies of e.g. the upper frequency band of H/2 are continuously or quasi-continuously monitored and assessed with regard to the result of the monitoring. The monitoring duration depends on the expected period T_x of the radar interference. Then, a quality parameter is allocated to each monitored frequency. The measurement on one frequency is immediately aborted as soon as an interfering periodic radar signal has been detected on that frequency with a certain probability. Thus, the start-up time may be reduced. Step S-1 may be performed by the radar detection unit RD depicted in Fig. 3.

After all frequencies have been monitored once, the AP continues with step S-2. Step S-2 may be performed by the dynamic frequency selection unit DFS depicted in Fig. 3.

During step S-2, all channels to which a high quality parameter has been allocated (e.g. (0) or a value of $P(f)$ satisfying a predefined threshold condition) are non-continuously but periodically measured. By means of the periodic measurements the average quality of each frequency can be assessed. Since the periodic measurements are very short, periodic interference signals can normally not be detected. The duration T_2 of step S-2 is randomly selected within a predefined range of time. By means of the randomly selected duration T_2 it

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ZIMMERMANN, G. et al.
Serial No. 10/674,791

Atty Dkt: 4114-8
Art Unit: 2681

is avoided that several APs or CCs, which have been switched on at the same time, switch synchronously from step S-2 to step S-3. After T_2 has lapsed, the AP or CC automatically selects the frequency with the lowest interference and best quality. The AP or CC then switches to step S-3.

In step S-3 the AP or CC periodically transmits in a non-regular transmission mode the BCH (Broadcast Channel, H/2) or beacon (IEEE 802.11a/h) on the frequency selected in step S-2. Any other transmission within the H/2 or IEEE 802.11a/h system is suppressed. No MT is allowed to associate to the AP or CC and to communicate with it. In the remaining part of the MAC (Medium Access Control)-frame between the BCH or beacon transmissions, the AP or CC continues to monitor the interference on the frequency selected in step S-2 and on the other frequencies. Like in step S-2, the monitoring is generally too short for detecting periodic interference signals.

In step S-3 DFS is enabled. This means that when the interference on the frequency selected during step S-2 increases and gets higher than for another frequency, the AP or CC automatically switches to the next best frequency with the lowest interference. The switching takes into account a predefined hysteresis to avoid too fast toggling between frequencies with similar or almost similar interference.

The duration T_3 of step S-3 is preferably fixed. Alternatively, it can be randomly selected within a predefined range of time. After T_3 has lapsed, the AP or CC automatically switches to step S-4. Now the advantage of the random duration T_2

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ZIMMERMANN, G. et al.
Serial No. 10/674,791

Atty Dkt: 4114-8
Art Unit: 2681

of step S-2 becomes apparent: Since the APs or CCs do not simultaneously switch to step S-3, when non-regular transmission is started some APs or CCs can measure the interference from the BCH or beacon transmission of neighboring APs or CCs and may react by selecting a different transmission frequency. From step S-3 the start-up mode ~~continuous~~ continues with step S-4.

Step S-4 corresponds to the normal mode of operation. The APs or CCs continue transmitting the BCH or beacon and allow the association of MTs and the communication with them. DFS remains enabled.

According to an optional further step, e.g., step S-5 (shown as optional by broken lines in Fig. 8), step S-1 is repeated in receive/transmit pauses during the normal mode of operation of the H/2 or IEEE 802.11a/h system. Again, a plurality of frequencies is continuously or quasi-continuously monitored. The repetition interval of the monitoring can be chosen in dependence on the system traffic load and/or the quality parameter previously allocated to the transmission frequency or other frequencies.

Instead of or additionally to implementing the method of the invention in the form of a start-up mode, the method may also be applied during regular operation of a H/2 or IEEE 802.11a/h system such that the method is performed each time a new frequency is selected by an AP or a CC. This means that every time a new frequency is selected (e.g. in accordance with DFS), this newly selected frequency is monitored and assessed and a quality parameter is allocated to this newly

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ZIMMERMANN, G. et al.
Serial No. 10/674,791

Atty Dkt: 4114-8
Art Unit: 2681

selected frequency. A continuous or quasi-continuous monitoring with a comparatively long monitoring duration (corresponding to W_{tot}) is used as previously described. The same measurement and decision procedure as illustrated above with respect to step S-1 of the start-up mode can be employed.

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